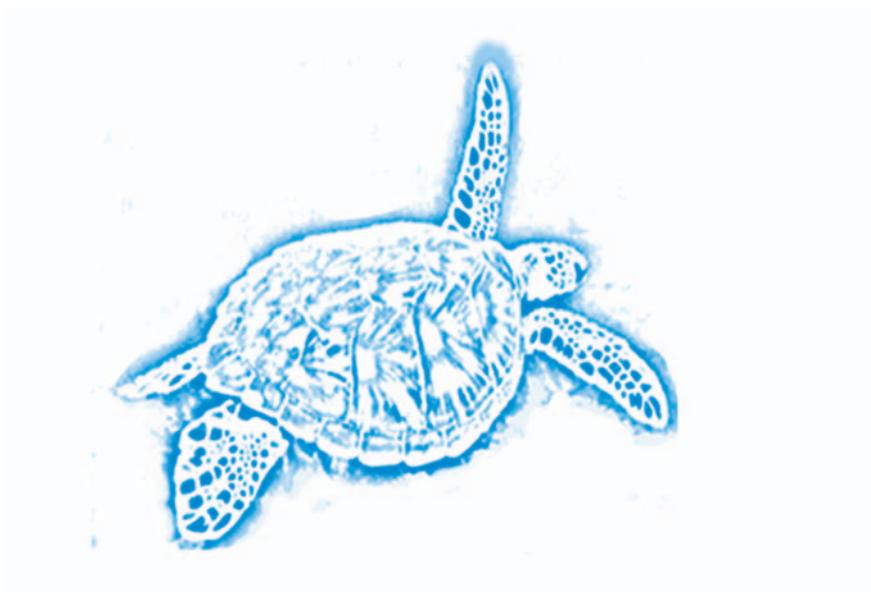


# **PROCEEDINGS OF THE FIRST MEDITERRANEAN CONFERENCE ON MARINE TURTLES**

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# THE STATUS OF MARINE TURTLES IN THE MEDITERRANEAN

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## INTRODUCTION

Three species of marine turtles, namely the Loggerhead *Caretta caretta*, the Green Turtle *Chelonia mydas* and the Leatherback *Dermochelys coriacea*, are encountered regularly in the Mediterranean. The Loggerhead and the Green Turtle have established local populations whereas the Leatherback, with a less common occurrence, is a visitor from the Atlantic.

Genetic studies reveal that the regionally established loggerhead and green turtle populations originate from western Atlantic stocks which colonized Mediterranean about 12,000 years ago at the end of the last glacial period (Bowen et al. 1993, Encalada et al. 1996).

## NESTING POPULATIONS

The main nesting concentrations of *Caretta caretta* in the Mediterranean are found in Greece, Turkey and Cyprus. Substantial nesting was also discovered in Libya (Laurent et al. 1997) but the nesting effort there needs to be quantified. Few nests are made each season in Egypt, Israel, Italy, Syria, Lebanon, Tunisia, and occasional nests in Spain (Tomás et al. 2002b, Margaritoulis et al. 2003). Monitoring of nesting areas in Cyprus, Greece, Israel, Tunisia and Turkey, range the total nesting effort in these countries from 3,375 to 7,085 nests per season (Margaritoulis et al. 2003). However, these numbers are considered minimum figures as they do not include nests outside the monitored areas or in countries where regular monitoring has not yet been initiated (e.g. Libya).

Nesting loggerheads in the Mediterranean are significantly smaller than those in other parts of the world. Moreover, there are body size differences within Mediterranean (Margaritoulis et al. 2003). Mitochondrial DNA analyses have shown that although loggerheads nesting in Greece and Cyprus share common haplotypes with those nesting in the western Atlantic they seem to have diverged genetically as a result of reduced gene flow (Bowen et al. 1993); this genetic isolation becomes more prominent in nesting areas of Turkey (Laurent et al. 1998). Further, it seems that there exists further genetic

differentiation among nesting areas of Turkey (Schroth et al. 1996) indicating the occurrence of sub-populations (Kaska 2000).

Nesting of *Chelonia mydas* occurs exclusively at the easternmost part of the Mediterranean, with the great majority of nests made in Turkey and Cyprus; few nests appear in Egypt, Israel and Lebanon. The total nesting effort of green turtles in the Mediterranean ranges from 350 to 1,750 nests per season (Kasperek et al. 2001). A genetic analysis of green turtles in Cyprus has revealed endemic haplotypes rendering an almost isolated green turtle population in the eastern Mediterranean (Encalada 1996).

## **INTERCHANGE BETWEEN MEDITERRANEAN AND THE ATLANTIC**

The relatively large number of juvenile loggerheads caught incidentally in the western Mediterranean invoked the question as to their origin. Argano and Baldari (1983) suggested that they were derived mostly from populations nesting in the eastern Mediterranean and, in part, from the Atlantic. Further, Carr (1987) indicated that loggerheads originating from beaches in the western Atlantic seem to follow a transatlantic developmental migration with some of them entering Mediterranean. This hypothesis was confirmed by tag recoveries (e.g. Bolten et al. 1992) and, also, by genetic studies in which it was found that about half of the pelagic loggerheads originate from Mediterranean populations and the other half from the western Atlantic (Laurent et al. 1998).

## **TURTLE MOVEMENTS WITHIN MEDITERRANEAN**

Existing data for turtle movements in the Mediterranean concern mainly *Caretta caretta* and have been accumulated mostly through long term tagging projects. Long-range recoveries of loggerheads tagged in Greece show a post-nesting wide dispersion in the Mediterranean with preference areas the Gulf of Gabés and the Adriatic Sea (Margaritoulis 1988b, Lazar et al. 2000). In Italy, a total of 1,047 loggerheads, mostly juveniles, were tagged after their capture in fishing gear. Of these, 4.8% have been recovered at both the eastern and western Mediterranean basins; the ones in the eastern basin exhibiting, more or less, the same preference areas as the post-nesting females from Greece (Argano et al. 1992). Further, juvenile loggerheads in the western Mediterranean seem to conduct seasonal migrations (Camiñas and de la Serna 1995).

The venturing of green turtles in the western Mediterranean is an exceptional event; probably a result of unfavourable temperature regimes. In the eastern Mediterranean, satellite tracking of green turtles from Cyprus have shown a post-nesting migration to Egypt and Libya (Godley et al. 2002). Although, juvenile green turtles seem to have a restricted dispersal, in comparison to loggerheads (Baran and Kasperek 1989), the discovery of green turtle developmental habitats in southern Greece (Margaritoulis and

Teneketziş 2003) and western Turkey (Türkozan and Durmus 2000) advocates more investigation to this matter.

The use of satellite telemetry, already undertaken on a small scale in the Mediterranean (Hays et al. 1991, Bentivegna 2002, Godley et al. 2002), is expected to assess important aspects on the behavioural ecology of marine turtles in the Mediterranean.

## **MARINE HABITATS**

Sea turtle marine habitats in the Mediterranean have been suggested as a result of concentrated tag recoveries or/and incidental captures in fisheries. Two major areas have been suggested: Gulf of Gabés and northern Adriatic Sea. These very extensive shallow areas seem to host benthic habitats for adult and juvenile loggerheads (Margaritoulis 1988b, Argano et al. 1992, Laurent and Lescure 1994, Lazar et al. 2000). Other benthic habitats of loggerhead and green turtles, indicated by the relatively high number of incidental captures in bottom trawlers, are found in the Nile delta (Laurent et al. 1996), the Bay of Iskenderun (Oruç 2001) and Lakonikos Bay (Margaritoulis et al. 1992). Turtle captures in pelagic fisheries as well as recoveries of tagged juveniles (Argano et al. 1992) suggest that both Mediterranean basins are exploited by pelagic loggerheads (Laurent et al. 1998).

## **THREATS ON NESTING AREAS**

The Mediterranean is a major destination of millions of tourists during the summer, which coincides with the nesting season. Several nesting areas in the Mediterranean are severely threatened by tourist development. Tourist installations impact directly reproductive procedures and either inhibit females from nesting or increase mortality of eggs and hatchlings. Deployment of beach furniture takes up vital space from emerging turtles and disrupts natural incubation of eggs. Vehicular traffic on beaches may destroy incubating clutches and hatchlings about to emerge. Bright lights disorient hatchlings which, instead of going to the sea, are attracted landwards where they succumb to dehydration and predation. Other issues of concern are sand mining, alteration of nesting habitat for agriculture, coastal industries and constructions meant to protect the beach from erosion (sea walls, etc.).

Special attention should be given to the threats, described by Kasperek et al. (2001), on the few major green turtle nesting areas in Turkey and Cyprus, hosting about 78% of the total nesting population in the Mediterranean.

The documented threats and the reduction of favourable nesting habitats have triggered management programmes to address the seemingly natural loss due to nest predation and inundation by the sea. Nest predation, notably by foxes, affects most nesting beaches in the Mediterranean, with the exception of some areas (e.g. Zakynthos) where

foxes are absent. Concerning loggerheads about 48.8% of nests at Kyparissia Bay were disturbed by predators in 1987 (Margaritoulis 1988a), 44.8% in Libya during 1995 (Laurent et al. 1997), 36.0% in Cyprus during 1994 (Broderick and Godley 1996) and 65-70% in Dalyan (Erk'akan 1993). Similar predation rates have been documented on green turtle beaches.

## **MORTALITIES AT SEA**

### **1. Past and Present Exploitation**

Sea turtles in the Mediterranean have suffered human exploitation for a long time. According to Sella (1982) it is estimated that from about 1915 until the middle 1930s at least 30,000 turtles, of both species, were caught offshore of today's Israel coast. A similar situation developed later at Mersin Bay and Iskenderun Bay where it is estimated that from 1952 until 1965 up to 15,000 specimens were taken from the shores of Mersin alone. The turtle-fishery stopped in 1965 after depletion of the local *Chelonia* population. In Italy, Di Palma (1978) notes that a specialized fishery operated north of Sicily, catching 500-600 turtles annually. Turtles were also sold until recently in Algeria and Morocco (Laurent 1990), Malta (Gramentz 1989), Spain (Mayol and Castello Mas 1983), and Tunisia (Laurent et al. 1990). The most recent case of turtle use concerns Egypt where, despite an enforcement of prohibition of turtle sales in fish markets, this seems to continue behind the scenes (Nada 2001).

### **2. Incidental Catch and Mortality in Fisheries**

Today there is a substantial incidental catch of sea turtles in Mediterranean fisheries. An estimated 20,000 juvenile loggerheads are caught annually by the Spanish longline fishery (Aguilar et al. 1995) and 2,000-2,500 turtles per year are caught in Tunisian trawlers in the Gulf of Gabés (Bradai 1992). Incidental captures of turtles in various fishing gear occur practically in all Mediterranean countries. Recently a cooperative project assessed turtle bycatch in the European Mediterranean trawl and drifting longline fisheries (Laurent et al. 2001). Turtle captures seem to be also high in "less industrialized" fisheries, as set gill nets. However, quantification of turtle captures in these widely spread fisheries is very difficult to assess.

Mortality following incidental capture has not been fully documented. Although turtles hooked in drifting long-lines are usually released by cutting the branch line, the effect of hooks left on turtles are not actually known. While turtles caught in trawler nets may suffocate and die, mortalities attributed to this reason appear generally low in the Mediterranean (Margaritoulis et al. 1992, Laurent et al. 2001, Oruç 2001). On the contrary, mortalities caused by set gill nets seem to be very high, e.g. 94.4% in Corsica (Delaugerre 1987). Further, a number of incidentally captured turtles, especially in set gill

nets, seem to be killed or mutilated deliberately by fishermen (Kopsida et al. 2002).

### **3. Boat Strike, Oil Pollution, Marine Debris**

Other reasons of turtle mortality at sea are boat strikes, oil pollution and ingestion of debris. Sea turtles spend a proportion of their time on the surface to breathe and rest between dives. At this time they are vulnerable to boat strikes, particularly from speedboats. The effect of boat strikes is of great concern in turtle frequented waters with dense tourist activities.

The effects of oil pollution are not known in detail, although small size specimens can be immobilized and exhausted by heavy oil pollution. Twenty out of 99 loggerheads, examined in the Maltese islands, were found contaminated, mostly with crude oil (Gramentz 1988).

Marine debris has been identified as harmful to sea turtles. Unattended or discarded nets, nylon bags, various buoyant plastics have been of main concern. Special attention should be given to floating plastics and tar balls, which are frequently mistaken by turtles for food items. This seems to be a major problem for pelagic juveniles in convergence zones where floating debris concentrates (Tomás et al. 2002a).

## **CONSERVATION AND MANAGEMENT**

### **1. Legal and Formal Aspects**

The World Conservation Union (IUCN) has recognized the vulnerability of marine turtles and according to the new criteria for Red List Categories has listed all three species, found in the Mediterranean, as “Endangered”. Further, the IUCN’s Marine Turtle Specialist Group (MTSG) produced a Global Strategy for the Conservation of Marine Turtles, which addresses research, management and conservation issues.

There are several international conventions containing provisions for the protection of marine turtles in the Mediterranean region. The most important are:

- a. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which prohibits trade of all species of marine turtles.
- b. The Convention on the Conservation of European Wildlife and Natural Habitats (also known as the Bern Convention), which includes sea turtles in the “strictly protected” list.
- c. The Convention for the Protection of the Mediterranean Sea against Pollution (known as Barcelona Convention) and its associated protocols, which includes marine turtles in the List of Endangered and Threatened Species.
- d. The Convention on the Conservation of Migratory Species of Wild Animals (CMS), also known as the Bonn Convention, provides valuable tools for

international co-operation with respect to conservation and management of migratory species, including marine turtles.

These conventions have a varying degree of application in the Mediterranean countries with the exception of Barcelona Convention to which all Mediterranean countries are signatories. The significance of Barcelona Convention, as far as marine turtles are concerned, is reflected (1) in the adoption of an Action Plan for the Conservation of Marine Turtles, and (2) in the establishment of a coordinating mechanism, known as RAC/SPA (Regional Activity Centre for Specially Protected Areas). Also the Bern Convention, an initiative of the Council of Europe, has taken a leading role, with an effective administrative structure, in establishing conservation recommendations for countries hosting important habitats for marine turtles.

Besides international and regional obligations, most Mediterranean countries have developed national legislation in protecting sea turtles. Furthermore, some countries have done steps in introducing site-specific protective legislation for nesting habitats. The very important nesting areas on Zakynthos have been recently incorporated in new legislation establishing a National Marine Park. In Turkey, the nesting beaches of Dalyan, Fethiye, Patara, Belek and Göksu Delta were designated a SPA status with Akyatan, the most important green turtle nesting area, being a Wildlife Reserve. In Cyprus, the Fisheries Law contains provisions for protecting the nesting beaches of Lara (Demetropoulos and Hadjichristophorou 1988).

## **2. Protection and Management of Habitats and Populations**

In general, protection and management measures aim in reducing disturbing factors. However, mechanisms for applying active management on nesting beaches are generally lacking. In some countries, state departments undertake this role, in other countries this is mostly done by NGOs and Universities.

Management of marine habitats is at an early stage. Management for these habitats, needing international cooperation, should be effected by securing appropriate bodies and mechanisms to enforce maritime legislation and fisheries regulations.

The high degree of public sensitization, noted the last years, requires the development of appropriate infrastructure to rehabilitate injured turtles. In the Mediterranean this is done either in existing aquaria (Bentivegna et al. 1993) or in facilities specifically established for this reason (Kallonas et al. 1998, Pont and Alegre 2000). However, hospitalizing sea turtles should not be considered as compensating incidental and intentional mortalities at sea.

### 3. Public Awareness, Education, Capacity Building

At a regional level, RAC/SPA produces or supports production of various informative material, reports and manuals. Further, RAC/SPA promotes capacity building on sea turtle conservation and management techniques by organizing or supporting training courses.

At a national level, public awareness projects, either aiming at specific target groups (e.g., fishermen) or at the general public, are conducted in several Mediterranean countries. It is of paramount importance that local stakeholders be incorporated in conservation plans; management techniques be explained to local people; involvement of local communities in conservation and management is a must, so that they comprehend the value of sea turtles and collaborate for their protection. Visitors at nesting areas should be sensitized and encouraged to participate in conservation efforts. Children comprise another important target group. Presentations by charismatic educators, especially designed traveling kits to be deployed by teachers, guided visits to nesting areas or rescue centres are activities enhancing public participation in conservation practices. The problem of incidental catch and subsequent mortality can be partly eased through appropriate awareness of fishermen. Awareness of fishermen is done in several countries; sometimes combined with assessment of turtle bycatch. The importance of the Italian project with fishermen was not only the collection of valuable data but also the successful sensitization of fishermen. A similar small-scale project gives fruit in Lakonikos Bay, where fishermen kill no more captured turtles, as they did by tradition (Margaritoulis et al. 1992).

### REGIONAL COOPERATION

Marine turtles are migratory species, to the extent that conservation efforts in one country could be undermined by harmful practices in another. Therefore, international cooperation and cooperative efforts are urgently needed to adequately study and protect marine turtles in the Mediterranean. Further, late maturity and longevity of marine turtles render the results of management to be evident only after many years, probably too long for any corrections. So, the precautionary principle should dominate conservation and management plans.

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